BELLSOUTH

Kathleen B. Levitz
Vice President-Federal Regulatory

April 1, 1998

Suite 900
1133-21st Street, N.W.
Washington, D.C. 20036-3351
202 463-4113
Fax: 202 463-4198
Internet: levitz.kathleen@bsc.bls.com

EX PARTE

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, NW, Room 222
Washington, D.C. 20554

Re: CC Docket No. 97-208, CC Docket No. 97-231, CC Docket No. 97-121, CC Docket No. 97-137, CC Docket No. 96-98, and RM-9101

Dear Ms. Salas:

This is to inform you that Sid Boren, Randy New, Guy Cochran, Jim Harralson, Jim Llewellyn, Al Varner, Robert Blau, and the undersigned, all of BellSouth Corporation, and Erwin Krasnow of Verner, Lipfert, Bernhard, McPherson & Hand, met with Commission staff on March 31, 1998. The following Common Carrier Bureau staff members attended some or all of this meeting: Carol Mattey; Melissa Newman; Michael Pryor; Bill Agee; Eric Bash; Lisa Choi; Tony Dale, Jennifer Fabian; Ron Kaufman; Bill Kehoe; Michael Kende; Joe Welch; and Audrey Wright. Michael Riordan, the Commission's Chief Economist, also attended the meeting.

During the meeting the participants discussed issues related to the evidence required to demonstrate that an applicant for interLATA relief meets the requirements of either Section 271(c)(1)(A) or (B) and of Section 272 of the Communications Act of 1934, as amended. Also attached is a copy of documents prepared at the staff's request that BellSouth shared with the staff at yesterday's meeting.

Because the Commission is considering one or more of the issues discussed at the meeting in each of the proceedings identified above, we are filing notice of this ex parte meeting in each of those proceedings.

As required by Section 1.1206(a)(2) of the Commission's rules, we are filing with the Commission two copies of this notice in each of the proceedings identified above.

Sincerely,

Kathleen B. Levitz

Kathleen B. Levitz
Vice President - Federal Regulatory

Attachment

cc:

Bill Agee	Eric Bash	Lisa Choi
Tony Dale	Jennifer Fabian	Ron Kaufman
Bill Kehoe	Michael Kende	Carol Mattey
Melissa Newman	Michael Pryor	Michael Riordan
Joe Welch	Audrey Wright	

BELLSOUTH'S EVIDENCE OF COMPLIANCE WITH CHECKLIST ITEM 3: POLES, DUCTS, CONDUITS, AND RIGHTS-OF-WAY

- BellSouth provides access to poles, ducts, conduits and rights-of-way under standard license agreements pursuant to section 224.

- License agreements may be executed on a state-wide or region-wide basis. These agreements specify the general terms and conditions applicable to all licenses granted the CLEC.

- A CLEC submits separate license applications for each set of poles, ducts or conduits to which access is desired. **Once approved this application becomes an approved license to either attach or occupy BellSouth poles, ducts, and/or conduit.**

- Multiple licenses may be granted under a single license agreement.

- BellSouth processes all requests for access on a first-come, first-served basis.

- BellSouth does not reserve space for its own future business needs or give itself a preference when assigning space.

- Because BellSouth is familiar with and maintains the engineering records for its own poles, ducts, and conduits, BellSouth may in some instances be able to identify the facilities it needs more quickly than CLECs. **However, BellSouth must take similar steps as CLECs take to make attachments or place facilities.**

- The time needed to implement access to BellSouth's poles, ducts, conduits, and rights-of-way varies, depending upon the CLEC's needs and the work that is required to satisfy those needs. The general process for obtaining a license is as follows:

1) The CLEC indicates its desire to accept BellSouth's standard agreement or negotiates a license agreement with BellSouth.

2) BellSouth mails the license agreement, together with its operational guidelines and forms, to the CLEC for signature.

3) Once the CLEC signs an agreement, the CLEC is responsible for specifying in writing the geographic area, type and quantity of facilities, and in-service date it requires.

4) BellSouth will make engineering records available to CLECs within five business days of a request to be viewed at the appropriate record maintenance center or, at the CLEC's option, will mail the information directly to the CLEC within twenty business days.

5) The CLEC then submits a license application, together with a proposed construction schedule. This application is a request for attachment to a specific set of poles or for use of specific duct or conduit. The construction schedule provides BellSouth guidance on how quickly a response is required.

6) BellSouth performs a pre-license survey to determine whether its facilities have space available for use and to identify any "make-ready" work required to allow CLEC use of the facilities. BellSouth will provide the CLEC at least 48 hours notice prior to initiating a field survey; the CLEC may elect to be present for that survey. The time required to determine the extent of make-ready work needed, and therefore to process the CLEC's application, varies. If an application is denied, however, BellSouth will advise the CLEC within 45 days. BellSouth also advises the CLEC of the date make-ready work can be completed if it is to be performed by BellSouth.

7) The CLEC pays for all "make-ready" work undertaken by BellSouth to prepare BellSouth's conduit systems, poles, or anchors and related facilities for the requested occupancy or attachment.

- Make-ready work includes clearing obstructions and rearrangement, transfer, replacement, removal, repair, enlargement, or modification of BellSouth's facilities. BellSouth does not charge for any changes that are made to meet BellSouth's needs, rather than the CLEC's.

- To the extent that parties other than BellSouth are required to perform make-ready work because they have facilities on the poles or in the conduit, all parties must work together to ensure timely completion of all necessary work.

8) The CLEC may contract with BellSouth or a BellSouth-certified contractor to perform make-ready work; some work must be performed by BellSouth pursuant to a joint use or collective bargaining agreement, whether the work is carried out for a CLEC's benefit or BellSouth's.

9) If the CLEC contracts with BellSouth to perform the make-ready work, BellSouth will follow its normal construction time frame. A CLEC may request that make-ready work be expedited. If BellSouth agrees, additional charges may apply.

10) After the required make-ready work is completed, a license for use of the poles, ducts, or conduit is issued to the CLEC. At this point no further work by BellSouth is needed to enable the CLEC to make its attachments or use the ducts and conduit.

11) The CLEC has one year after issuance of the license to make its attachments or place its facilities in the specified ducts or conduits. If not used within one year, the space becomes available for others to use and the license is canceled.

- CLECs are responsible for maintenance of and any work required with respect to facilities attached to BellSouth's poles or placed in BellSouth's ducts or conduits.

- While BellSouth generally requires 48 hours notice from CLECs seeking access to manholes to investigate facilities, a shorter time frame may be worked out in an emergency.

- BellSouth and the CLEC will each provide 60 days written notice, if practicable, regarding modification, relocation, and replacement of facilities covered by the license agreement.

- Numerous CLECs have negotiated license agreements with BellSouth that allow them to attach their facilities to BellSouth's poles and place their facilities in BellSouth's ducts and conduits.

- BILLING AND FEES

  - BellSouth charges for administrative processing costs incurred prior to issuing the license at cost-based time and materials charges.

  - Charges for make-ready work performed by BellSouth are payable in advance.

  - Rental fees are based on the FCC's formula, rates established by the state commission, or negotiated rates.

  - No rental fee is charged to the CLEC until a license covering the specific BellSouth facilities at issue has been issued. There is a one-month minimum charge. The monthly fee is prorated for the time between issuance of the license and the beginning of the first monthly billing period.

  - In all states except Kentucky, CLECs are billed on or about July 1. The bill assesses fees for six months in arrears (January through June) and six months in advance (July through December). **If the license was granted at some point between August and December of the previous year, the bill will include fees in arrears from the first day of the calendar month following the date the license was issued through June, as well as fees for the six-month period after July 1 (July through December).** In Kentucky, the same process applies except that bills are issued twice a year (on or about January 1 and on or about July 1), and are rendered in advance.

  - Upon cancellation of a license the CLEC is billed for space utilization from the period covered by the last bill through the date of removal of the CLEC's facilities.

BELLSOUTH'S EVIDENCE OF COMPLIANCE WITH CHECKLIST ITEM 4: UNBUNDLED LOCAL LOOPS

- BellSouth provides nondiscriminatory access to the following loop types under the Statement: Service Level 1 ("SL1") and Service Level 2 ("SL2") 2-wire voice grade analog lines, 4-wire voice grade analog lines, 2-wire ISDN digital grade lines, 2-wire Asymmetrical Digital Subscriber Lines ("ADSL"), 2-wire and 4-wire High-bit-rate Digital Subscriber Lines ("HDSL"), 4-wire DS1 digital grade lines and 4-wire 56 or 64 Kbps digital grade lines. As described in BellSouth's Statement of Generally Available Terms and Conditions, SL1 is a non-designed circuit with engineering information documentation available at an additional charge, while SL2 provides a designed circuit with a design layout record and test access.

- BellSouth provides access to loops: at any technically feasible point; with access to all features functions, and capabilities; unbundled from other UNEs; of equal quality to what BellSouth provides itself; without any restrictions that impair use by CLECs; for a CLEC's exclusive use; and in a manner that enables CLECs to combine loops with other UNEs.

- In addition to the unbundled loop, CLECs may request loop distribution, loop cross connects, loop concentration in the central office, and access to the Network Interface Device ("NID") as described below:

    - Loop distribution (or "distribution media") provides a transmission path for 2-wire voice-grade analog loops between a feeder distribution interface and the NID at the customer's premises. If the CLEC were to take loop distribution as an unbundled element, then the CLEC would presumably provide its own feeder facilities to its own switch.

    - Loop cross connects allow the end-to-end local loop to be extended from the main distribution frame in BellSouth's central office to a CLEC's collocated space. BellSouth provides 2-wire and 4-wire voice grade cross connects as well as DS1 and DS3 cross connects.

    - Loop concentration enables CLECs to concentrate up to 96 sub-loops on 2 DS1s for the purpose of connecting the sub-loops (at a concentrated level) to BellSouth's feeder system.

    - The NID provides a single line termination device or that portion of a multiple line termination device required to terminate a single line or circuit. The NID, located on the customer's premises, establishes the official network demarcation point between a telecommunications company and its end user customer. The NID used in residential applications also provides a protective ground connection as required in

Article 800 of the National Electric Code 1996. BellSouth provides access to the NID on an unbundled basis, regardless of whether a state commission treats the NID as a separate UNE or a subloop element. CLECs also may order a loop-NID combination. If a CLEC orders an unbundled loop, BellSouth will provide the NID also, upon request of the CLEC.

- BellSouth is not able to provide an unbundled loop where integrated digital loop carrier ("IDLC") technology is used.
    - IDLC is a complete loop integrated with the switch. This includes loop facilities, multiple NIDs, distribution media, remote terminal and feeder. The feeder interfaces directly to the digital switch at the DS1 level without the requirement for a central office terminal or other demultiplexing equipment.
    - Nevertheless, several alternatives have been investigated for those loops served by IDLC, including:
        - Alternative 1: Reassign the loop from an integrated carrier system and use a physical copper pair.
            - If sufficient physical copper pairs are available, BellSouth will assign the unbundled loop to a physical copper pair.
            - Available facilities are those that are generally available for use rather than those installed for another specific purpose.
            - Unavailable facilities could include, but are not limited to the following: Unloaded pairs in a loaded area reserved for digital services or limited physical copper pairs placed in a Carrier Serving Area for services that cannot be integrated.
        - Alternative 2: In the case of Next Generation Digital Loop Carrier ("NGDLC") systems, "groom" the integrated loops to form a virtual Remote Terminal ("RT") set-up for universal service.
            - "Groom" means to assign certain loops (in the input stage of the NGDLC) in such a way that discrete combinations of multiplexed loops may be assigned to transmission facilities (in the output stage of the NGDLC). This is a technically feasible alternative in cases where NGDLC facilities are available.
                - Both of the NGDLC systems currently approved for use in the BellSouth network have "grooming"

capabilities; however, the availability of this option is limited.

- Given that NGDLC is still a relatively new technical capability, there is currently an insufficient amount of NGDLC in the BellSouth network to meet AT&T's expected demand. Indeed, only a small percentage of lines are served via NGDLC.

- Since some special service circuits cannot be supported through an integrated system, some NGDLC capacity is normally reserved to support those special service circuits through a universal arrangement based on site-specific forecasts. This option is available only where fully approved NGDLC systems are operating.

- As in the case of Alternative 1 described above, available facilities are those that are generally spare and available for use rather than those placed to meet other specific needs.

- BellSouth's procedures for reusing customer loops when an end user transfers service from a local service provider ("LEC-A") to a new local service provider ("LEC-B") are described below. These procedures apply irrespective of the local exchange carriers involved.

  - BellSouth will process and issue due dates for disconnect and reconnect or change orders to transfer the service using current interval guidelines.

  - The serving facility for the retail or resale service, unbundled loop and/or unbundled port will be reused for the same end user at the existing location.

  - LEC-A (if not BellSouth) will be notified subsequent to the disconnect function being completed.

- BellSouth's times for processing loop orders are as follows:

  - <u>Order and Provision and Unbundled Switch Port and Loop</u>

    Order processing: 43 minutes for residential; 59 minutes for small business; 79 minutes for large business (plus 10 minutes for each additional line)

Provisioning:	Ports: 3 days (1-10 ports); 4 days (11-25 ports) Loops: 5 days (1-5 loops); 7 days (6-14 loops)

- Order and Provision a Resale "Switch as Is"

Order Processing:	43 minutes for residential; 59 minutes for small business; 79 minutes for large business (plus 10 minutes for each additional line)
Provisioning:	Same day if received by 3:00 p.m. EST; otherwise next business day

- Order and Provision a PIC Change:

Order Processing:	30 minutes
Provisioning:	Same day if received by 3:00 p.m. EST; otherwise next business day

- *Unbundled loops are installed in accordance with BellSouth's published technical reference, TR 73600. Excerpts from that technical reference are provided as Attachment A.*

- *BellSouth will provide further information on technical standards for unbundled loops if desired by the Commission.*

- *The quality of BellSouth's unbundled loops is verified by the performance measurements BellSouth has established for maintenance and repair. These measurements reveal, among other things, the incidence of trouble on BellSouth lines as compared to the incidence of trouble on unbundled loops used by CLECs.*

- BellSouth informs CLECs through various channels whenever repair work may require loops to be taken out of service or whenever there is a network outage. Notification is provided by BellSouth's repair centers when they are aware of an outage condition or by the BellSouth Network Management Center if such an understanding has been reached between BellSouth and the CLEC. CLECs can negotiate the process for network outage notification. AT&T, for example, has negotiated an agreement for notification by the BellSouth Network Management Center. See AT&T Agreement Attachment 5, ¶ 3.1.7.

- As of December 31, 1997, BellSouth had provisioned 9,276 unbundled loops to CLECs in its nine-state region.

- BellSouth has tested the availability of: (1) 2-wire and 4-wire unbundled voice loops; (2) 56 Kbps and Basic Rate Interface unbundled digital loops; (3) unbundled DS1 with bundled interoffice transport; (4) ADSL capable loop and; (5) HDSL 2-wire and 4-wire capable loops. An order for each of these items was generated and flowed through BellSouth's systems in a timely and accurate fashion. Billing records were reviewed as part of the end-to-end testing to verify that each item had been billed correctly.

- BellSouth conducted a study of its cutover results. Of a sample 325 loops provisioned to a CLEC in Georgia. 318 loops (98%) were cut-over within 15 minutes. BellSouth has taken steps to address the problems that contributed to delays for the other 2 percent and, in that process, has addressed each of the specific allegations regarding loop cutovers raised by commenters in section 271 proceedings to date.

- Where repair is required to correct a deficiency and BellSouth is at fault, BellSouth covers all charges for the repair of unbundled loops.

- There will be no significant increase to the loop length as a result of provisioning the loop to the collocation space. Typically, the loop and the associated cross-connect to the collocation space would not be any longer than the loop and the associated cabling to a BellSouth switch. BellSouth will make whatever adjustments are necessary to ensure that the unbundled loop types requested meet the appropriate performance characteristics. The CLEC would be responsible for making any adjustments between its collocation space and the CLEC switch. In addition, due to the fact that the loop is not connected to the BellSouth switch, the CLEC will be responsible for providing any switch-based conditioning.

Checklist Item # 4

Attachment 1 (20 sheets)

TR73600
Issue A

BELLSOUTH
TELECOMMUNICATIONS

UNBUNDLED LOCAL LOOP – TECHNICAL SPECIFICATIONS

Technical Reference

March, 1997

NOTICE

This Technical Reference describes Unbundled Local Loops provided by BellSouth Telecommunications (BST), Inc. An Unbundled Local Loop provides a transmission path between a BST central office and an end–user location. This document describes the signals as they appear at the associated interfaces. It also describes some aspects of the performance of the channel.

BST reserves the right to revise this document for any reason, including but not limited to, conformity with standards promulgated by various governmental or regulatory agencies, utilization of advances in the state of the technical arts, or the reflection of changes in the design of any equipment, techniques, or procedures described or referred to herein. Liability to anyone arising out of use or reliance upon any information set forth herein is expressly disclaimed, and no representations or warranties, expressed or implied, are made with respect to the accuracy or utility of any information set forth herein.

This document is not to be construed as a suggestion to any manufacturer to modify or change any of its products, nor does this document represent any commitment by BellSouth Telecommunications to purchase any product whether or not it provides the described characteristics.

Nothing contained herein shall be construed as conferring by implication, estoppel or otherwise, any license or right under any patent, whether or not the use of any information herein necessarily employs an invention of any existing or later issued patent.

If further information is required, please contact:

Director — Transport Systems Engineering
BellSouth Telecommunications, Inc.
3535 Colonnade Parkway — Room W1F1
Birmingham, AL 35243

UNBUNDLED LOCAL LOOP – TECHNICAL SPECIFICATIONS

CONTENTS

UNBUNDLED LOCAL LOOP – TECHNICAL SPECIFICATIONS

1. General

1.1 Scope

This document provides the technical specifications for the Unbundled Local Loops offered by BellSouth Telecommunications (BST). Unbundled Local Loops enables an Competitive Local Exchange Carrier (CLEC) to provide services to an end–user location. While Unbundled Local Loops supporting a wide variety of signaling schemes are available, the widespread use of Digital Loop Carrier (DLC) in the BST network requires that a particular signaling scheme be specified when an Unbundled Local Loop is ordered.

1.2 Availability

Unbundled Local Loops are provided subject to availability on a first–come first–served basis.

1.3 Revisions

This is the first version of this document. In future revisions, this section will provide an overview of the changes made with that revision.

2. References

The following documents are referenced:

(1) ANSI T1.401–1993, *Telecommunications — Interface Between Carriers and Customer Installations – Analog Voicegrade Switched Access Lines Using Loop–Start and Ground–Start Signaling*

(2) ANSI T1.405–1996, Telecommunications — Interface Between Carriers and Customer Installation Interfaces, Direct–Inward–Dialing Analog Voicegrade Switched Access Using Loop Reverse–Battery Signaling

(3) ANSI T1.407–1990, *Telecommunications — Interface Between Carriers and Customer Installations — Analog Voicegrade Special Access Lines Using Customer–Installation–Provided Loop–Start Supervision*

(4) ANSI T1.410–1992, *Telecommunications — Carrier–to–Customer Metallic Interface – Digital Data at 64 kbit/s and Subrates*

(5) ANSI T1.413 – 1995, *Telecommunications — Network and Customer Installation Interfaces — Asymmetric Digital Subscriber Line (ADSL) Metallic Interface*

(6) ANSI T1.601–1992, Telecommunications — ISDN Basic Access Interface for use on Metallic Loops for Application on the Network Side of the NT

(7) ANSI/IEEE 455–1985, *Standard Test Procedure for Measuring Longitudinal Balance of Telephone Equipment Operating in the Voice Band*

(8) ANSI/IEEE 743–1995, *Standard Equipment Requirements and Measurement Techniques for Analog Transmission Parameters for Telecommunications*

(9) Committee T1 Technical Report No. 28, A Technical Report on High–Bit–Rate Digital Subscriber Lines

(10) Bellcore TA–TSY–000077, Digital Channel Banks – Requirements for Dataport Channel Unit Functions

(11) Bellcore SR–TSV–002275, BOC Notes on the LEC Networks – 1994

3. Overview

3.1 Loop Topology

Unbundled Local Loops extend from the Main Distributing Frame (MDF) in BST's Central Office (CO) to the End User Interface). They may be composed in either of the following arrangements:

- entirely of paired metallic conductors, or
- the concatenation of a universal DLC channel with paired metallic conductors.

3.2 Digital Loop Carrier

The use of DLC brings up the following two considerations.

- Some technologies, such as High Bit–rate Digital Subscriber Line (HDSL), cannot be transported via DLC due to the bandwidth employed. When a customer is served by DLC, an Unbundled Local Loop providing such a wide bandwidth will not typically be available.
- Many dedicated voiceband circuits employ signaling that requires unique DLC line cards.

3.3 Inductive Loading

Of the loops employing only metallic facilities, a significant percentage are loaded. Loading involves the placement of inductors, typically every 6000 feet, in the loop. These inductors introduce intolerable attenuation at frequencies above the voiceband, again making wide bandwidth services unavailable.

3.4 Types of Unbundled Local Loops

Due to the above considerations, a number of types of Unbundled Local Loops have been developed in order to simplify the ordering and provisioning process. The different types of loops can be placed into the following categories:

- Basic Unbundled Loop
- Analog Unbundled Loop with Specified Signaling
- Digital Unbundled Loop

The most prevalent means of voiceband exchange access involves a loop–start interface, with the exchange carrier providing the battery feed. Because this arrangement is widely used, Unbundled Local Loops supporting such signaling have been assigned a unique category, denoted the Basic Unbundled Loop.

An Unbundled Analog Loop with Specified Signaling is intended to interconnect locations via 'private–lines.' This arrangement provides a voiceband transmission channel with various signaling options.

The Digital Unbundled Loop provides a channel that can support one of a described set of digital transmission schemes.

3.5 Interfaces

Unbundled Local Loops are available with two–wire and four–wire interfaces, depending on the particular type. The same number of wires will be provided at both the MDF and the End User Interface. For two–wire interfaces, one conductor is denoted Tip and the other is denoted Ring. For four–wire interfaces, the conductors of one pair are denoted Tip and Ring, the conductors of the other pair are denoted Tip 1 and Ring 1.

The interface at the MDF is not accessible by the CLEC. Instead, it is connected to other BST unbundled elements, or it is connected – via tie cabling – to collocated CLEC equipment. The tie cabling is not part of the unbundled loop.

3.6 CLEC Equipment Requirements

In addition to applicable FCC, NEC, and UL requirements and orders, CLEC equipment shall also meet the following requirements:

- The dc voltage applied to either conductor shall be negative with respect to ground
- The open–circuit dc voltage applied to any conductor shall be less than 80 Vdc when measured to ground or any other conductor.
- The power delivered to a load via BST facilities shall not exceed 2.5 watts.
- The current provided, via BST facilities, shall not exceed 150 mA.

3.7 Right to Disconnect

BST reserves the right to disconnect a service or equipment connected to an unbundled local loop that either: (a) fails to meet these requirements, or (b) is shown to be causing harm to other services or systems.

4. Basic Unbundled Loop

4.1 General

This loop provides a voice grade transmission channel suitable for loop–start signaling and the transport of analog voice grade signals. This loop is typically used to provide switched access telephone service.

This loop is provides loop–start signaling, arranged for battery–feed by the CLEC and loop closure by the end–user. This loop is only available via a 2–wire interface.

4.2 Signaling Requirements

In practically all cases employing metallic facilities, the loop resistance (the sum of the resistance of both tip and ring) is less than 1500 Ω.

In those cases where loop resistance exceeds 1500 Ω, it will never exceed 2800 Ω. In these cases, BST cannot meet the prescribed signaling requirements at the End User Interface unless the CLEC provides sufficient voltage at the office end of the circuit. The open circuit tip–to–ring dc voltage provided by the CLEC equipment shall be less than 80 Vdc.

Except for this potentially greater loop resistance, the requirements in 6.2 apply to the Basic Unbundled Loop.

4.3 Transmission Requirements

In those rare cases where the loop resistance exceeds 1500 Ω , the insertion loss at 1 kHz, measured with a 900 Ω termination at the MDF and a 600 Ω termination at the End User Interface will never exceed 15 dB. Except for this potentially greater loop loss, the transmission requirements of Section 7 apply to the Basic Unbundled Loop.

4.4 Signal Power Requirements

The signal power requirements for the Analog Unbundled Loop, with the loop–start option, apply to the Basic Unbundled Loop.

4.5 Optional Data Over Voice

If facilities permit, Data Over Voice (DOV) may be used on the Basic Unbundled Loop. This option is not available when DLC is employed. Due to the stringent transmission requirements, it is not available on many metallic loops.

If DOV is employed, crosstalk into other cable facilities is a concern. Accordingly, the CLEC is responsible for limiting the Power Spectral Density (PSD) of the signal, transmitted at both the End User interface and at the MDF interface. The PSD shall be limited to that specified in Clause 6.13 of ANSI T1.413–1995.

If Asymmetric Digital Subscriber Line (ADSL) Technology (as described in the above–referenced document) is employed, installations shall meet the following requirements in order to minimize interference to other systems:

- The 'downstream' data path, as defined in the above standard, shall be in the MDF–to–NI direction.
- The 'upstream' data path shall be in the NI–to–MDF direction.

The loop facility shall meet the transmission requirements of Section 8.4.3.

5. Unbundled Analog Loop with Specified Signaling

5.1 Supported Signaling

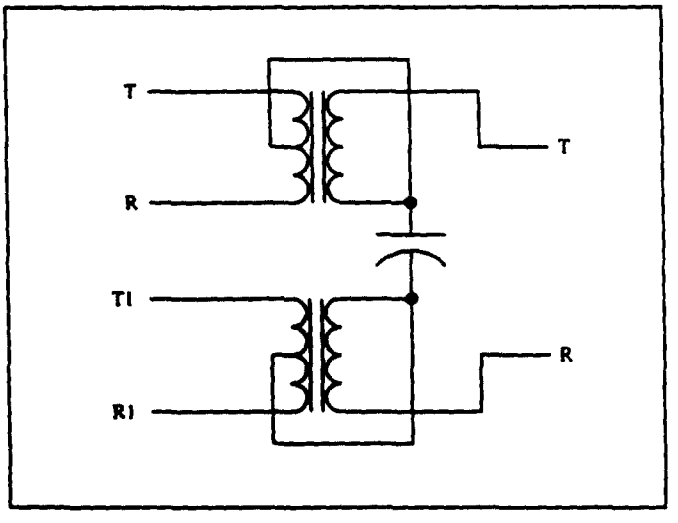
The following signaling types of signaling are available:

- Loop–Start
- Ground–Start
- Reverse–Battery

These types of signaling are described briefly below. Bellcore SR–TSV–002275 Bellcore SR–TSV–002275 contains a more thorough discussion. Section 6 contains detailed requirements for these types of signaling at both interfaces of an Unbundled Analog Loop with Specified Signaling.

5.1.1 Two–wire and Four–wire Signaling

In the discussion below, a two–wire circuit is assumed. Four–wire circuits employ similar signaling, except that the dc signaling — instead of being applied directly to the tip and ring conductors — is applied to a center–taps of coupling transformer, so that the dc signals appear in the common–mode across both conductors of each of the four–wire pairs. A circuit suitable for the conversion of four–wire to two–wire is shown below.



5.1.2

The two ends of a loop–start circuit are denoted the office end and the station end. The office end provides a voltage across Tip and Ring. In the idle state, the station presents a high resistance across Tip and Ring. To request service, the station presents a low resistance between the conductors. The resultant current flow is detected by the office end. To alert an idle station of an incoming call, the office end applies ringing voltage, relative to ground, to the Ring.

Loop–start circuits arranged with the office end at the MDF interface are commonly used to provide exchange access service. Section 6.2 contains requirements signaling requirements for both the MDF and End User interfaces.

5.1.3 Ground Start

Ground–start signaling is similar to loop–start, except that in the idle state, the office doesn't apply a voltage across Tip and Ring. Instead it applies a voltage, relative to ground, on only the Ring. This results in the following differences, relative to loop–start service:

- In order to request service, the station provides a low resistance from Tip to ground. Sensing current flow in the Ring, the office provides a (differential) voltage across both Tip and Ring. Upon the application of the differential voltage, the station places a low resistance across the Tip and Ring, and removes the shunt to ground.
- Upon alerting the station, the office applies differential voltage, even between bursts of ringing. If suitably arranged, the station can sense this differential voltage and detect the alerting signal, even before a ringing burst is sent by the office.

Ground–start circuits arranged with the office end at the MDF interface are often used to provide two–way trunks to a PBX. Section 6.4 contains signaling requirements for both the MDF and End User Interface in such an arrangement.

5.1.4 Reverse–Battery

Reverse–Battery signaling is typically used on trunks, rather than lines. There is no 'office end' or 'station end' convention. Ringing is not employed. Reverse–battery signaling accommodates only one–way trunks[1]. For this reason, the ends of the circuit are usually denoted the originating and terminating end.

The terminating end of the circuit provides a voltage across Tip and Ring. In the idle state, the originating end presents a high resistance across Tip and Ring. To request service, the originating end places a low resistance across the conductors. The terminating end senses the resultant loop current. To signal that toward the originating that, for instance, it is ready to accept address digits, the terminating end reverses the polarity across Tip and Ring.

The originating end can return to idle by removing the low resistance across Tip and Ring. If properly equipped, the originating end can sense a reversal of polarity as an indication of return to idle by the terminating end.

Reverse–Battery circuits, with the originating end at the MDF, are often used to provide Direct Inward Dialing (DID) trunks to PBX's located behind the End User Interface. Section 6.5 contains signaling requirements for such an arrangement.

[1] The term "one–way" indicates that a trunk can only be originated from one end, the voice–frequency capability is bi–directional.

5.2 Supported Signaling and Interface Combinations

The following signaling and interface combinations are supported.

Number of Wires	Signaling Options
2	Loop–start signaling – office end at MDF
2	Ground–start signaling – office end at MDF
2	Reverse–Battery – originating end at MDF
4	Loop–start signaling – office end at MDF
4	Ground–start signaling – office end at MDF

6. Signaling Requirements for Analog Loops

6.1 General

When metallic facilities are employed, signaling and supervision is dependent, of course, on the source voltage (provided by either the CLEC equipment or BST equipment to which the loop is connected), and the total circuit resistance. In practically all cases, the loop resistance (the sum of the resistance of both tip and ring) is less than 1500 Ω[2]. The dc resistance between the tip conductor and ground and the ring conductor and ground shall each be greater than 100 K ohms.

Except for instances within ringing burst (as described below) the CLEC shall not apply voltages to either conductor that are positive with respect to ground. Current supplied by CLEC equipment shall be less than 150 mA. Voltages from either conductor to ground shall be more positive than −80 Vdc.

When DLC is employed, both the DLC system and the CLEC must employ compatible signaling. The following requirements are intended to ensure such compatibility, both when the loop is provided via DLC and via metallic facilities.

The following requirements apply to both two–wire and four–wire interfaces. For purposes of clarity, the requirements are based on two–wire interfaces. When four–wire interfaces are employed, references and/or measurements to Tip apply to the common mode (simplex) path via both Tip and Ring. Similarly, references and/or measurements to Ring apply to the common mode (simplex) path via Tip 1 and Ring 1.

6.2 Loop–Start – Office End at MDF

6.2.1 General

An Analog Unbundled Loop with Specified Signaling provided via DLC may not support distinctive ringing or forward disconnect.

[2] In those cases where loop resistance exceeds 1500 Ω, signaling and/or transmission equipment will be provided by BST to meet the specifications in this document.

6.2.2 MDF Interface

6.2.3 Idle State

In the idle state, the CLEC equipment shall provide an open circuit Tip–to–Ring voltage between 42.5 and 80 Vdc. The Ring shall be negative, relative to the Tip. No positive voltage — relative to ground — shall be applied to either conductor.

In the idle state, the loop shall provide a dc resistance at the MDF meeting either of the following requirements:

- A dc resistance between Tip and Ring $\geq 10{,}000\ \Omega$ (loop provided via DLC), or
- A dc resistance between Tip and Ring $\geq$ the parallel combination of the following:
  - the series combination of the on–hook dc resistance of connected equipment at the End User Interface and the dc resistance of the loop, and
  - a leakage resistance of $100{,}000\ \Omega$

6.2.4 Alerting State

In the alerting state, the CLEC equipment shall alternately apply a ringing signal and the normal idle–state potential. The ringing signal shall be applied to the Ring conductor. The voltage on the Tip conductor, relative to Ground shall be between 0.0 and −5.0 Vdc. In any six–second period, there shall be at least three continuous seconds of the normal idle–state voltage. The ringing signal shall consist of an ac signal superimposed on a dc signal.

The requirements of the ac component are as follows:

- The frequency shall be 20 ± 3 Hz.
- The magnitude shall be between 84 and 104 V_{rms}.
- The waveform shall have a peak–to–rms ratio between 1.35 and 1.45.
- The ac current into a line shall be limited to less than 220 mA.

The potential of the dc component shall be between −36 and 56.6 Vdc, relative to ground.

The ringing signal (ac component + dc component) shall be applied to the Ring, with a source impedance $\leq 500\ \Omega$. Ground shall be applied to the Tip, with a source impedance of $\leq 500\ \Omega$.

The ringing signal shall be removed within 200 milliseconds after the line has gone off–hook, as defined below. The ringing signal shall not be 'tripped' when ringing into the parallel combination of the following:

- 10,000 Ω of dc resistance
- a 2 μF capacitor
- the series combination of 1386 Ω and 20 μF (simulating 5 bridged ringers)

6.2.5 Off–Hook State

The CLEC equipment shall recognize a resistance of 1900 Ω applied between Tip and Ring at the MDF as off–hook. For interoperability with loops with resistance greater than 1500 Ω, the CLEC equipment shall recognize a resistance of 3200 Ω applied between Tip and Ring at the MDF as off–hook. In either case, the CLEC must provide at least 20 mA through the limiting resistance.

The CLEC shall also meet the following requirements:

- The power delivered to any load via Tip and/or Ring shall not exceed 2.5 W.
- The current provided, via Tip and/or Ring, shall not exceed 150 mA.

In the off–hook state, the loop shall provide a dc resistance at the MDF meeting one of the following requirements:

- A dc resistance between Tip and Ring ≤ 1150 Ω (loop provided via DLC), or
- A dc resistance between Tip and Ring ≤ the series combination of the on–hook dc resistance of connected equipment at the End User Interface and the dc resistance of the loop.

6.2.6 End–User Interface

Signaling provided by connecting equipment at the End User Interface shall meet the Customer Installation requirements in ANSI T1.401 – 1993. The loop shall meet the network requirements in ANSI T1.401 – 1993.

6.3 Ground–Start – Office End at MDF

6.3.1 General

This arrangement is commonly used to support two–way trunks providing switched access to PBX's.

An Analog Unbundled Loop with Specified Signaling provided via DLC may not support distinctive ringing or forward disconnect.

6.3.2 MDF Interface

6.3.3 Idle State

In the idle state, the CLEC equipment shall provide an open circuit Ring–to–ground voltage between 16 and 55 Vdc. The Ring shall be negative, relative to ground. The dc resistance from Tip to ground shall be ≥ 50,000 Ω.

In the idle state, the loop shall provide a dc resistance at the MDF meeting one of the following requirements:

- A dc resistance from Ring to Ground ≥ 10,000 Ω (loop provided via DLC), or
- A dc resistance from Ring to Ground ≥ the parallel combination of the following:
  - the series combination of the dc resistance from Ring to Ground at the End User Interface and ½ of the dc resistance of the loop, and
  - a leakage resistance of 100,000 Ω

6.3.4 Alerting State

The CLEC shall meet the requirements of 6.2.4.

6.3.5 Service Request State

To initiate a call, the end–user places a low resistance from Ring to Ground. When a resistance of ≤ 580 Ω is placed from Ring to Ground at the End User Interface, the loop shall provide a dc resistance at the MDF meeting one of the following requirements:

- A dc resistance from Ring to Ground ≤ 900 Ω (loop provided via DLC), or
- A dc resistance from Ring to Ground ≤ the series combination of the dc resistance from Ring to Ground at the End User Interface and ½ of the dc resistance of the loop.

6.3.6 Off–Hook State

Upon application of the Ring ground in the Service–Request State, the CLEC equipment shall provide a current–feed interface meeting the requirements of 6.2.5.

The loop shall present a dc resistance across Tip and Ring meeting the requirements of 6.2.5.

6.3.7 End–User Interface

Signaling provided by connecting equipment at the End User Interface shall meet the Customer Installation requirements in ANSI T1.401–1993. The loop shall meet the network requirements in ANSI T1.401–1993.